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TYPHOID FEVER AND GASTROENTERITIS.

A REPORT OF AN OUTBREAK AMONG PASSENGERS OF THE STEAMSHIP ROCHESTER, SEPTEMBER-OCTOBER, 1913.

By HUGH DE VALIN, Passed Assistant Surgeon, United States Public Health Service.

The *Rochester*, of the Richelieu & Ontario Steamship Co., was chartered by the Perry Centennial Commission to take a party, 300 in number, of citizens and members of various military organizations of the State of Rhode Island to attend the Perry Centennial Celebration at Put-in-Bay, Ohio, and other points. The itinerary of the trip was as follows:

The party left Providence, R. I., at 8.30 a. m. September 8, 1913, and proceeded by train to Buffalo, N. Y., arriving at that point at 11.30 p. m. the same date. Two meals were served en route by the railroad company, a basket lunch put on at Springfield, Mass., and later a dinner in the dining car attached to the train. Upon arrival at Buffalo the party boarded the *Rochester* and spent the night on board, the ship remaining at Buffalo. On the morning of September 9 a trip was made by rail to Niagara Falls, the party returning to the ship at Buffalo in the afternoon. The *Rochester* sailed from Buffalo at 3 p. m. September 9 and arrived at Put-in-Bay on the morning of September 10. At this place the party was ashore attending the centennial exercises. At 5 p. m. the *Rochester* left for Cedar Point, Ohio, arriving there at 7 p. m. A banquet was served on shore at Cedar Point and was attended by the officers of the Rhode Island military organizations and certain of the citizen members of the *Rochester* party. A few members of the party who did not attend the banquet went to Sandusky for the evening. The *Rochester* with all on board left Cedar Point at 5 a. m. on September 11 and returned to Put-in-Bay, arriving there at 7 a. m. The passengers were again ashore at this point attending the centennial exercises. At 5 p. m. the *Rochester* sailed for Detroit, Mich., arriving there at 9 p. m. This same evening, September 11, a number of the *Rochester* party took a short trip on board the ferryboat *Promise* to Belle Isle, Detroit. A lunch was served on board. On September 12 a lunch was served at the Hotel Pontchartrain, Detroit, and was attended by practically all the members of the *Rochester* party. At 11 p. m. on September 12 the *Rochester* sailed for Buffalo, arriving there at 9 p. m. on September 13. The party remained on board for the night, taking train for Providence on the morning of September 14 and arriving at their destination at 11 p. m. the same date. En route from Buffalo to Providence two meals were served by the railroad company, breakfast in the diner attached to the train and basket lunch put on board at Albany, N. Y.

Reports concerning 235 members of the party have been received, and in this number there occurred 122 cases of gastroenteritis, and 42 cases of typhoid-like attacks, including 5 deaths.

The cases of gastroenteritis varied in severity from those having a diarrhea of only a few hours' duration to those in which the diarrhea was severe, lasting for several weeks, and accompanied by more or less prostration, slight febrile course, general malaise, and gastric disturbances. The typhoid-like cases varied in type from mild paratyphoid-like attacks to cases in which there was presented a clinical picture of severe typhoid fever. These 42 cases were reported as having their respective dates of onset in the period between September 21 and October 12. Of these, 29 gave histories of primary diarrhea occurring some little time before the dates on which they were considered to have had their definite onsets. Of the gastroenteric cases 101 gave histories of dates of onset during the period from September 9 to 15. The remaining 19 developed on various dates from September 16 to 22. There were 51 cases occurring on September 14, 19 on September 13, and 13 on September 15, making a total of 83 for those three days, and showing that the effects of the infection were felt most acutely during that period.

Another Rhode Island party, 122 in number, on the steamship *Greyhound*, followed the same itinerary as the *Rochester* party, visiting the same points and attending the same functions on shore. In this party there occurred but 12 cases of diarrhea, of short duration, and since the return home there have developed no cases of gastroenteritis or typhoid.

Careful inquiry on all points showed no probability of the infection, which caused the outbreak, having been acquired on shore at any of the places visited. The *Greyhound* party served as a valuable control in the elimination of any probable factors other than those which may have existed on the *Rochester* itself, as the trips of the two parties, with the exception of the time spent on board their respective ships, were practically identical.

The investigation brought out the fact that there had been numerous cases of more or less persistent diarrhea among the *Rochester's* crew, not only on this trip, but during the entire season. Four cases of typhoid fever among the crew were also reported in the persons of an electrician who was admitted to hospital on August 16, a stewardess who left the ship "ailing" on September 20 and was admitted to hospital as a typhoid case on October 10 and subsequently died, a water tender who was feeling badly when he left the ship on September 20 and was later diagnosed as a case of typhoid, and a meat cook who was admitted to the United States Marine Hospital, Buffalo, N. Y., on September 15 in the febrile stage of the disease.

As outbreaks, similar to the one which occurred among the *Rochester's* passengers, directly traceable to infection by sewage-polluted drinking water, have occurred from time to time on various ships operating on the Great Lakes and in cities which derive their

water supplies from the Lakes, an investigation as to the drinking water used on board the *Rochester* during the trip in question was made. The capacity of the water tanks on board not being great enough to permit the carrying of a sufficient supply to last during an entire trip of this character, it was necessary to take on water several times at a number of different places. The chief engineer of the *Rochester* stated that water was taken on direct from Lake Erie on at least six different occasions on certain dates while the ship was on certain definite courses.

Results of thorough examinations of Lake Erie water, which have been made from time to time, show that several of the stated sources of the *Rochester's* drinking water may be considered questionable as to safety; and the water stated as having been taken on board on September 11, half way between Cedar Point and Put-in-Bay, and again on the same date, between Put-in-Bay and Detroit half way to Bar Point Light, is considered to have been obtained not only from a decidedly unsafe source, but from an area which shows frequent sewage pollution.

In reference to the meat cook above mentioned as having been admitted to hospital with typhoid fever on September 15, it may be stated that this man gave history of having been ill with the disease since about September 1 and of having had a more or less profuse diarrhea not only during the trip, but for some time previous. While the ship was in Detroit on September 12 he consulted a physician and at that time was found to be running a febrile course. However, no definite diagnosis of typhoid was made at that time. According to his statement, he had worked in the ship's galley, where all food was handled and prepared, during the trip, until the afternoon of September 11, when he felt so badly that he had to lay off and go to bed. During the trip he cooked meats, made soups, gravies, and entrees, and occasionally helped with the salads.

Taking into consideration the various facts which were developed during the course of the investigation, I am of the opinion that the factors which may be considered as operative in causing the outbreak are sewage-polluted water taken on board at some point and furnished to passengers and crew for drinking purposes, and the presence of the meat cook, with profuse diarrhea and in the febrile stage of typhoid fever, in the galley during the major portion of the trip, where food was handled and prepared for all on board.